

To a study of the preimaginal instars of *Pseudojana incandescens* WALKER, 1855 with remarks on the biology of the species

(Lepidoptera, Eupterotidae)

by

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Abstract: Larval and pupal morphology are considered for *Pseudojana incandescens* WALKER, 1855 (Lepidoptera: Eupterotidae) of a Vietnamese population. Chaetotaxy is given for L1. A telescopic foundation of the setae in L1 is supposed to be an additional autapomorphy of the group. On a set of characters, the genus *Pseudojana* HAMPSON, 1893, is close to *Apha* WALKER, 1856 and both can be joined in a separate group.

The article is devoted to a study of the preimaginal stages of *Pseudojana incandescens* WALKER, 1855, - a large and robust monkey-moth from a small Oriental genus joined with 5 externally similar species. NÄSSIG & OBERPRIELER (2008: 63) include the genus in the subfamily Striphnopteryginae WALLENGREN 1858, but such point of view needs special verification and is not supported here.

HOLLOWAY (1987: 70-71) in his revision of Bornean fauna notes that the preimaginal stages are unknown for the genus; it is surely a mistake because already MELL (1929) gave a complete description of caterpillars and pupa for a south China population and figured larvae in colour; hence, a chaetotaxy was not studied in that time.

Material for the article comprises 6 first instar caterpillars, mature caterpillars and pupae collected by ZOLOTUHIN in N. Vietnam, Prov. Lao Cai, Fan-Si-Pan Mts., Sa Pa, 1500 m, 10.-20.V.2006, as well as mature and mid-instar caterpillars and pupae collected in Central Vietnam, Thua Thien Hue Prov., A Ruang, 663 m, 16°04'N, 107°29'E (leg. ZOLOTUHIN & NEDOSHIVINA).

The chaetotaxy was studied on the first instar caterpillars fixed in 70-80% ethanol. The right side was cut for more rapid maceration and the whole larva boiled about 15-20 min in 10% NaOH solution in a tube plunged in water. The skin cleansed from tissues is washed with boiled water. The skin is additionally cleansed with a micro-brush and the head capsule is carefully separated from the rest of the body using micro scissors. The body skin with chaetae is fixed in ethanol (sequentially through 50%, 80% and 96%) and mounted in Euparal. The preparation is studied after that using a light microscope.

The head is also fixed in alcohol but a cover glass is laid on small glass supports to avoid undue pressure. If necessary, such structures as mandibles, labrum and labio-maxillary complex are extracted and laid separately on the same glass.

From the above material, a total of 6 chaetotaxial dissections were made using the dissecting techniques described and mounted in Euparal on glass slides. Illustrations were all based on Euparal-mounted preparations and photographed under magnification using an Olympus Camedia C-750 camera with Soligor Adapter Tube for Olympus and Slide Duplicator for Digital 10 dptrs modified for object glasses as well as through binocular eyepieces. All halftone figures in the article were produced by S. PUGAEV using Adobe Photoshop 7.0. The colour plate was produced using CorelPhotoPaint X3 from photographs taken by ZOLOTUHIN, other than those illustrations taken from MELL (1929), as denoted.

Results

Egg (col. pl. 1: 1): Semispherical light brown without distinct pattern, with flattened base, and a micropyle laid in a small depression on dorsal pole, diameter is about 2 mm.

First instar caterpillar (col. pl. 1: 2): 6-8 mm, whitish or yellowish with black ringed fasciae on each segment. Head is dark yellow, with smooth shining surface; thoracic legs are also dark yellow.

The caterpillars of later instars can be of two main colour forms. One of these is olive yellow with tufts of black and white hairs (col. pl. 1: 6), another black with few ash-grey hairs (col. pl. 1: 5).

Final instar caterpillar (col. pl. 1: 7-10) - mainly completely covered with long black hairs with admixture of dorsal tufts of white hairs. Some specimens are olive green with sole white and black hairs (col. pl. 1: 10). In both forms, head, legs and prolegs are bright red. Contrary to most other genera, the hairs are not situated in tufts forming a very special appearance. Caterpillars look like extremely hairy arctiid larvae but with setae not situated on verrucae.

Chaetotaxy (the chaetotaxy is given using nomenclature of HINTON, 1946):

Head chaetotaxy (fig. 2): Head is orthognathous, semispherical, without processes, with small but distinct depression on vertex. Frontal suture is longer than suture of vertex and epicranial index is 0.76. Frontal F1 is situated higher than a pore Fa; both AF2 and AF1 are situated in higher half of frontal suture and AF2 takes the same position as AFa; clypeal chaetae C1 and C2 stay in typical position; the chaetae of the fore group form an isosceles triangle with A2 and A3 near the epicranial suture situated opposite chaetae C1 and A1 correspondingly, and A1 is closed to ocellus 2 and 3; lateral chaetae L1 and L2 form a direct line with A3; a single chaeta of P group is visible; pores MDa and Pb were not found; chaetae of ocellar group S1, S2, and S3 all in a standard position; S1 in front of ocellus 6, S3 behind it, S2 behind ocellus 1; chaeta SS1 situated before ocellus 5, and SS2 behind it. Ocelli 2-4 are well developed contrary to 1, 5 and 6 which are much smaller, not so concave, with weakened pigmentation (probably weakly functional or non-functional). Labrum generally of rectangular shape (fig. 4) with weak medial cut, with standard set of chaetae: M1 situated equidistantly upper and lower edge of the labrum near to medial axis, chaetae of M group form a triangle, there is a pore between M1 and M2 as well as a larger one between M2 and M3, lateral L1 and L2 are situated on the edge of labrum and above whereas L3 takes marginal position below. Mandible is scoop-shaped (fig. 5) with four pointed molar teeth, each mandible with two setae, and larger one (twice as long) is more basal.

Body chaetotaxy (fig. 1): Body chaetae undifferentiated, all almost of the same size, length and colour. They are situated only on sclerotized verrucae or smaller shields forming regular vertical rows.

D group: D1 and D2 on T1 are situated on an elongated prothoracic shield separately caudally in a vertical row. On T2-T3 they are

joined on the common spherical verruca with numerous subprimary setae. On A1-A8 both chaetae are separated and D1 is situated on spherical prominent verrucae among subprimary chaetae at the time D2 is single and moved to the middle of a segment. On A9, both D1 and D2 again fused on one verruca.

SD group: SD are situated on T1 on a prothoracic shield between subprimary chaetae. There is a single SD on T1-T2 which takes its place between L and D verrucae. On A1-A9 it is strong, on triangular sclerotized verruca under D, and it is absent from A10.

L group forms a spherical verruca on T1-T3, with unnumerous subprimary chatae and is situated below SD-group. L1 and L2 are solitary on A1-A8. L1 is situated behind the stigmal opening and L2 below it. L1 is solitary on A9 and takes position between SD and SV. L group is absent from A10.

SV group: On T1-T3 the chaetae of SV group are formed by large ellipsoid verrica with 7-10 setae (both primary and subprimary). On A1-2 and A7-9 they form a complex from a large verruca and 2-4 solitary chaetae a bit lower the verruca. SV group is completely absent from A3-A6 and A10.

V group: A single seta of V group is situated on each side of T1-T3, A1-A2, A7-A9 in standard position and is absent on A3-A6 and A10.

Microchaetae: MD takes position in front of D1 on A1-A9. A pore is situated on A1-A8 nearby MD. MV is situated in front of SV-group. Anal shield triangular and covered with chaetae in regular rows.

As was pointed out by MINET (1998), the coxae of the forelegs are fused (fig. 7) - the character was considered by him as an autapomorphy of the family. Also, it was found by us that foundations of all primary setae are telescopic (fig. 3). This was so for all caterpillars of L1 studied, also from other genera (*Apha* WALKER, 1855, *Striphnopteryx* WALLENGREN, 1858, *Palirisa* MOORE, 1884, *Jana* HERRICH-SCHÄFFER, 1854); seemingly they may be an autapomorphy of the Eupterotidae.

Pupa is subcylindrical (figs 8, 9; col. pl. 1: 13, 14), 42-45 mm, abdominal segments are densely covered with ochreous flattened scales. Frontal shield matt. Labial palpi reach a connection line between forewings (fig. 11). Forelegs, mid-legs and antennae reach labial palpi. Genae touch dorsally to antennae and ventrally - to fore legs. Antennae not thicker than mid-legs. Mandibles well recognizable. No cremaster present.

Moths (col. pl. 1: 14) produce a single generation in Vietnam with flight period from March to May. Pupation on the ground in a very weak cocoon loosely connected to some fallen leaves. Pupa diapauses from September to April.

Host plants: MELL (1929: 450-451) writes that caterpillars of the Chinese population were found on a variety of trees and bushes, of which only the following three could be identified: *Lasianthus*, *Adina globiflora* and *A. rubella*. All are arboreal plants from the Rubiaceae (Cinchoideae). MELL doubts if the species is restricted really only to Rubiaceae or is rather polyphagous. In Vietnam, the caterpillars were found only on Rubiaceae (near to *Adina* sp.), both on trees higher than 15 metres and on seedlings about 1 m high, and a lot of caterpillars of different instars can be found per tree; sometimes the host, especially immature ones, is completely defoliated (col. pl. 1: 12). Thus, the presumption of MELL seems to be correct and the species is bound with arboreal Rubiaceae quite commonly in the tropics.

A comparison of the preimaginal instars of *Pseudojana incandescens* WALKER, 1855, with those of other Eupterotidae (*Palirisa*, *Striphnopteryx*, *Apha*) allows us to separate some characters that can be diagnostic for the genus *Pseudojana* WALKER.

1. Molar surface of mandible with triangular pointed teeth - not rounded as in *Palirisa*, either untoothed as in *Striphnopteryx*.
2. Chaetae are situated on the verrucae in regular vertical rows.
3. No SV chaetae are present on A3-A6.
4. Mature caterpillars with even covering of hairs, not combined in tufts.
5. Abdominal segments are covered with short flattened scale-like chaetae (hooks in *Apha* WLK. or without hairiness in most genera).
7. Cremaster is absent (a rudimentary cremaster is visible in many other genera).
8. Mandibular cases are distinct and visible in pupa.
6. Cases of labial palpi in pupa reach the forewings (also in *Apha* WLK.).

Thus, on the set of characters, the genus is closed to *Apha* WLK. and seemingly it can be joined in a special separate group. Its status will be considered later after additional information will be found.

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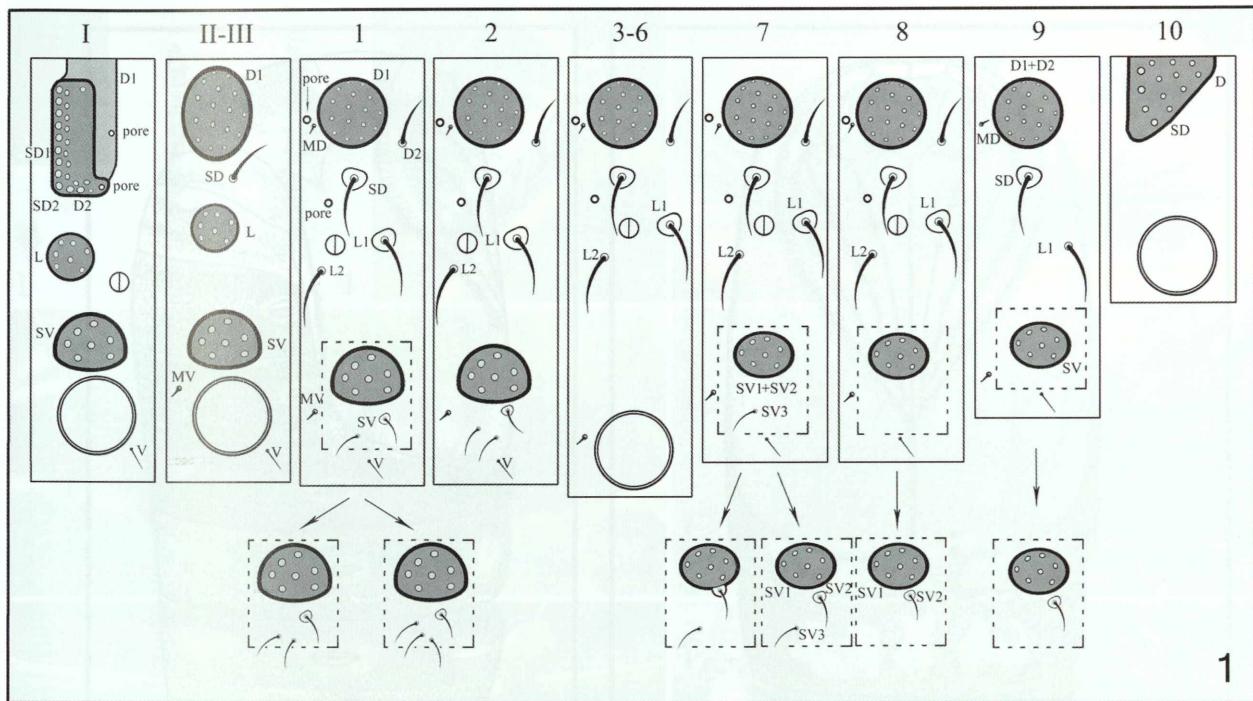
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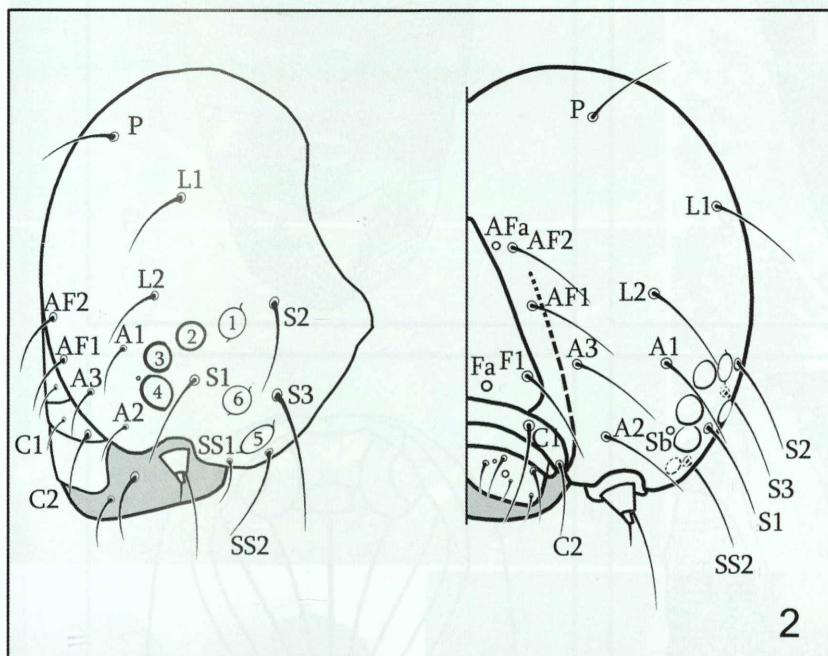
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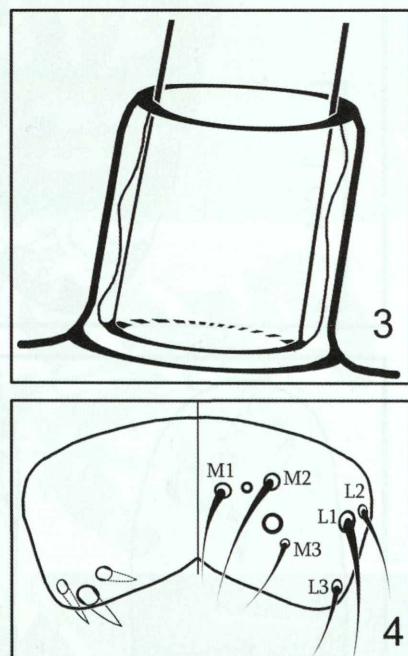
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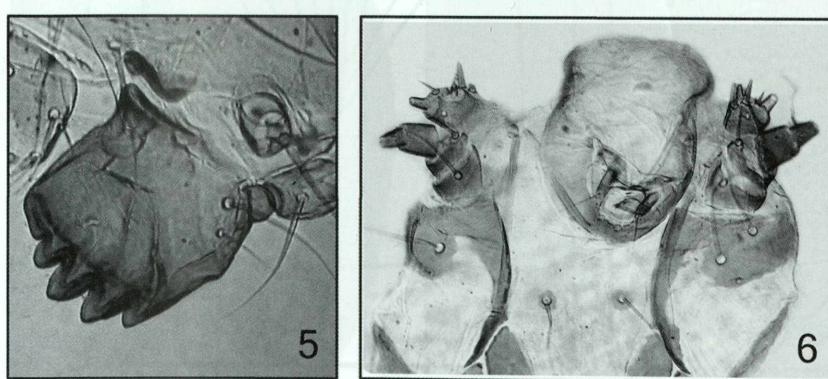
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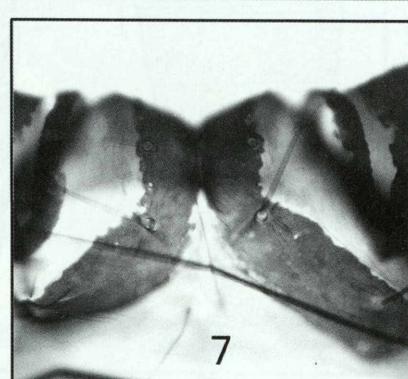
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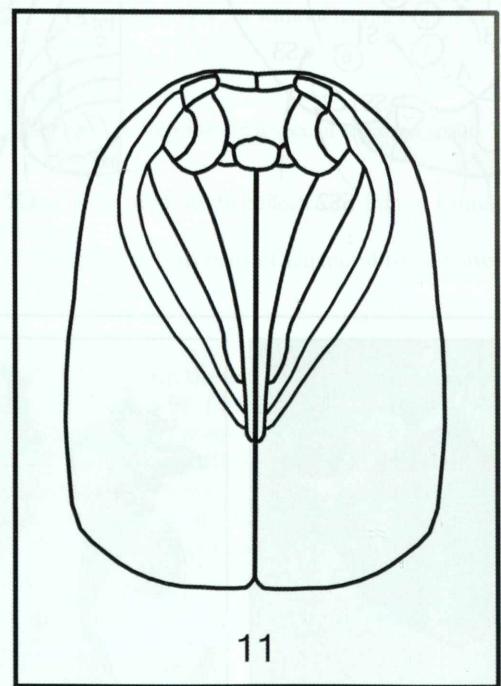
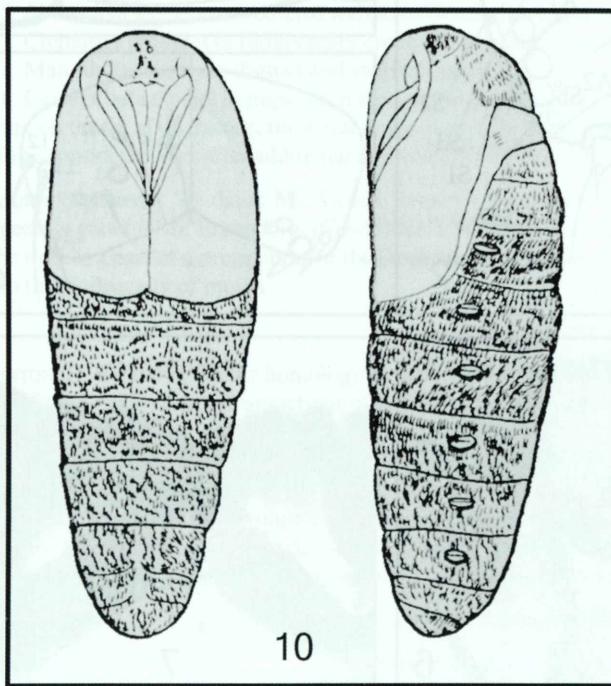
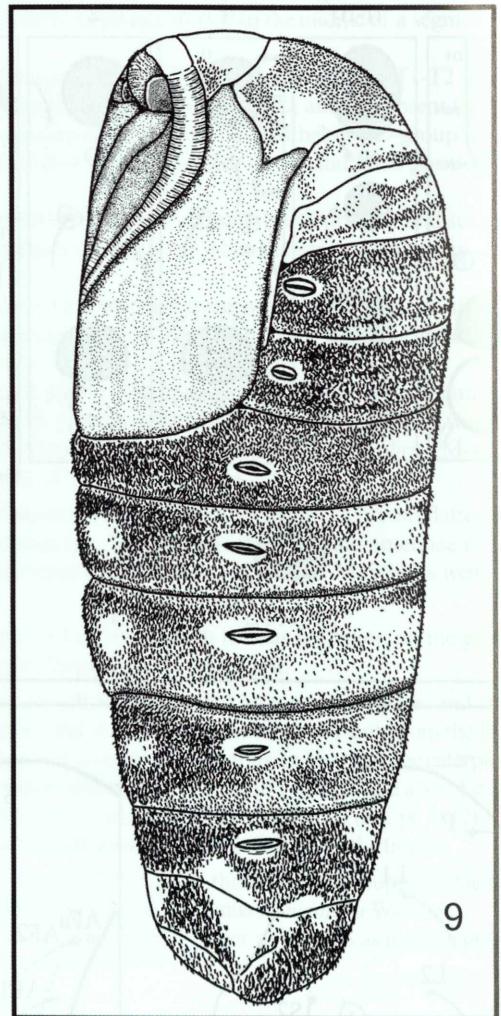
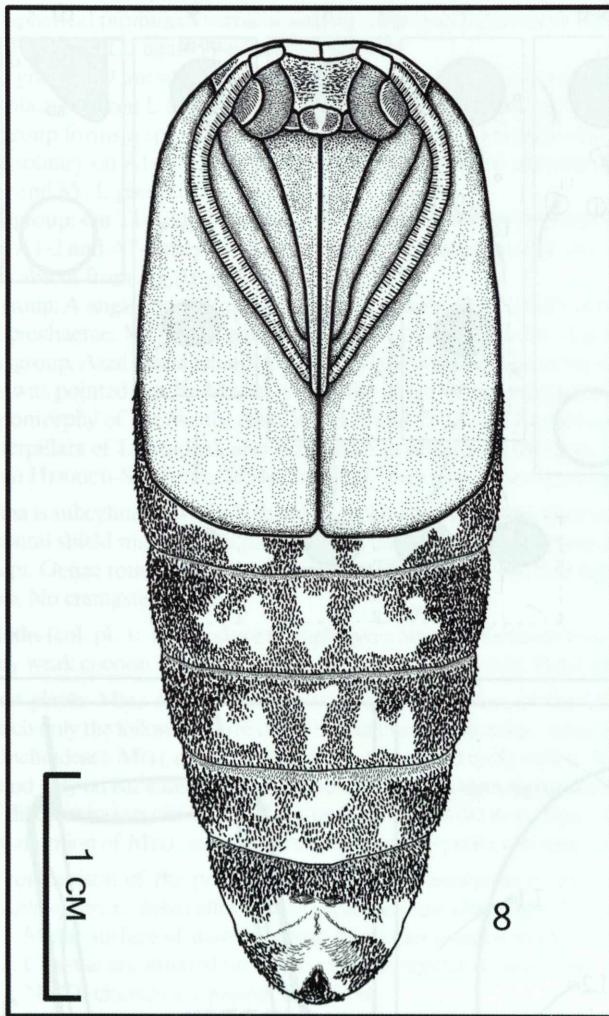


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Figs 1-7: Chaetotaxy and morphology of L1 larva of *Pseudojana incandescens* WALKER, 1855 (orig.): (1) body chaetotaxial scheme, (2) larval head, (3) base of primary chaeta showing its telescopic shape (scheme), (4) labrum, (5) mandible, (6) labium, (7) fused fore leg coxae.

damaged by the parasitic larva

coming to a light trap before death



Figs 8-11: Pupa of *Pseudojana incandescens* WALKER, 1855: (8) ventral view (orig.), (9) lateral view (orig.), (10) figures of pupa given by MELL (1929: figs. 49, 50), (11) frontal shield of pupa showing sclerites (scheme, orig.).

Colour plate 1



Figs. 1-14: *Pseudojana incandescens* WALKER, 1855, stages of a life circle (original if not stated otherwise): (1) eggs (env. Sa Pa), (2) L1 caterpillar taken from ethanol (env. Sa Pa), (3-4) L2-L4 caterpillars (from MELL, 1929; Taf. 9: 6, 7), (5) penultimate caterpillar (A Ruang), (6) the same by moulting to last instar (A Ruang), (7) mature caterpillar (A Ruang), (8) the same larva disturbed (A Ruang), (9) mature caterpillar paler colouration (env. Sa Pa), (10) mature caterpillar of olive-green colouration rolled up on the ground (env. Sa Pa), (11) biotope (A Ruang), (12) tree of *Adina* sp. damaged by the caterpillars visible on the branch (A Ruang), (13) pupae (env. Sa Pa), (14) abdomen of pupa enlarged (env. Sa Pa), (15) moth coming to a light trap between fallen leaves (China, Guangdong) (photo: V. SINJAEV).